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The determinants of the composition of public debt in developing and emerging market countries☆

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Abstract

This paper uses a new dataset on the composition of public debt in developing and emerging market countries to look at the correlation between country characteristics and domestic debt share. While the paper finds that most variables have the expected sign, it also finds that country characteristics cannot explain regional differences in the composition of public debt. Moreover, the paper finds a weak correlation between inflationary history and the composition of public debt. The paper explores the determinants of this finding and shows that the results are driven by the presence of capital controls.

JEL classification: F21; F34; F36; G15

Keywords: Public debt; Government bond markets; Debt structure; Sovereign bonds

1. Introduction

The objective of this paper is to document recent trends in the composition of public debt across a large sample of developing and emerging market countries and test whether there are empirical regularities that explain the choice between domestic and external public debt. Our analysis yields two surprising results. First, contrary to what is found by several studies on the determinants of bond market development in emerging market countries, we find that our large set of control variables plays a limited role in explaining cross-country differences in the composition of public debt. Second, we find that inflationary history has no statistically significant effect on the composition of public debt. In particular, we do not find evidence that countries with a history of high inflation have lower shares of domestically issued debt. When we look carefully at this latter result, we find that it is driven by the presence of capital controls. We show that in countries with high levels of capital controls there is no statistically significant correlation between domestic debt share and inflationary history. However, in countries with low and intermediate levels of capital controls, we find that inflationary history has a negative and statistically significant impact on domestic debt share. This suggests that capital controls have a negative effect on the development of the domestic debt market in countries characterized by high policy credibility but may help developing the domestic bond market in countries characterized by low policy credibility.[1]

We are not the first to study the determinants of debt composition in developing and emerging countries. However, previous research focused on bonded debt and restricted the analysis to the 27 emerging market countries covered by the Bank of International Settlements (BIS) survey on domestic securities. To the

☆ All the opinions expressed in this paper are the authors' and should not be attributed to any organization they are or have been affiliated with. The usual caveats apply.

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[1] Of course this positive effect is likely to vanish if countries that impose capital controls continue to adopt irresponsible policies. However, in countries that are seriously committed to improve policy credibility, capital controls can be considered as an additional policy instruments in building a local debt market. For a discussion of financial repressions see Reinhart and Sbrancia (2011).

best of our knowledge, our paper is the first that covers a large sample of countries. Four papers that are closely related to our work are Burger and Warnock (2006), Claessens et al. (2007), Eichengreen and Luengnaruemitchai (2004), and Borensztein et al. (2008).

Burger and Warnock (2006) were the first to use BIS data on domestic securities to study the determinants of local bond market development (they use both private and public sector bonds). Their sample covers up to 49 countries and includes 27 emerging market countries and 22 advanced economies. The main findings of Burger and Warnock are that policies and institutions play an important role in the development of the local government bond market. In particular, they find that low inflation, rule of law, and country size are positively correlated with the development of the domestic government bond market and that the fiscal balance and GDP growth are negatively correlated with the size of the government bond market.

While Burger and Warnock work with cross-sectional data, Claessens et al. (2007) use panel data to study the determinants of the development of the market for local currency government bonds. Their sample (which is also based on BIS data) covers up to 36 countries (of which 12 are emerging markets and the remaining are advanced economies) for the 1993–2000 period. Their results are consistent with those of Burger and Warnock (2006). In particular, they find that country size, size of the banking system (as measured by total deposits over GDP), good institutions, low inflation, flexible exchange rates, and fiscal burden are positively correlated with the size of the domestic bond market. In addition, they find that countries with flexible exchange rates tend to have larger domestic bond markets.

Eichengreen and Luengnaruemitchai (2004) also use panel data techniques and BIS data to study the determinants of domestic bond market capitalization in 41 countries over the period 1990–2001 (they do not restrict their analysis to government bonds and include all types of issuers). Compared to Claessens et al. (2007), Eichengreen and Luengnaruemitchai (2004) use a larger set of controls and confirm the finding that country size and institutional quality are positively associated with the development of the domestic bond market. Contrary to Claessens et al. (2007), however, Eichengreen and Luengnaruemitchai (2004) find that lower exchange rate volatility is positively correlated with the size of the domestic bond market and argue that this might be due to the fact that a fixed exchange rate lowers currency risk and may encourage foreign participation. They also find that countries without capital controls tend to have larger bond markets.

Borensztein et al. (2008) build upon Eichengreen and Luengnaruemitchai (2004) but expand their sample and distinguish between the determinants of the development of markets in government, corporate and financial sector bonds, rather than considering the bond market as a single aggregate. Moreover, their analysis uses a difference-in-differences methodology suitable for identifying the differential effects of country characteristics on the development of different segments of the bond market. Finally, they run separate regressions for emerging markets. In line with previous studies, Borensztein et al. (2008) find that country size is significantly correlated with the size of bond market but that the relationship is non-linear. In addition, they find that bond market development is positively correlated with trade openness, total public debt, institutional quality, lack of capital controls, and the privatization of the pension system. With respect to interest rates, they find that the level of the domestic interest rate is negatively correlated with market capitalization but that there is no significant correlation between banking spreads and the size of the government bond market. When they focus on a sub-sample of 21 emerging market countries, Borensztein et al. (2008) find that country size no longer appears to matter and that the positive effect of public debt becomes much smaller.

There are three differences between our paper and the four papers discussed above. The first difference relates to the definition of public debt. The previous papers focused on bond market development while we focus on total public debt.

The second difference is in regard to country coverage. The papers discussed above examine a relatively small group of emerging market countries, whereas our paper covers up 95 developing countries, of which 33 are low-income countries. Moreover, the analysis of the previous papers jointly included developing and industrial countries (with the partial exception of Borensztein et al. (2008) and one may suspect that most of the variance in bond market development was driven by the difference between these two groups of countries. Accordingly we address this issue in this paper by focusing exclusively on developing countries.

The third difference relates to the methodology. While previous studies either focused on cross-country differences (Burger and Warnock, 2006) or jointly looked at cross-country and within countries differences, our battery of statistical tests also use fixed effect estimations which allows for the isolation of the determinants of changes within countries.

2. Data and trends

Lack of reliable data has been the main obstacle to the analysis of the composition of public debt in developing countries. In this paper, we use a new public debt dataset (assembled by Panizza, 2008) which aims to capture both the domestic and external component of public debt. This new dataset consists of an unbalanced panel of 1558 observations covering 104 developing countries for the 1990–2007 period (Table 1 shows the coverage of the dataset by year and region).[2] In the remainder of this paper we use a subset of the original dataset based on an *almost* balanced panel that covers developing countries for the 1994–2006 period.

2.1. Trends

Domestic public debt is not a new phenomenon for developing countries. Reinhart and Rogoff (2008) collect data on

[2] Most of the data refer to central government debt, but when central government debt data were not available, Panizza (2008) used data for the general government and the non-financial public sector.

Table 1
Countries included in the domestic debt dataset.

Year	EAP	ECA	LAC	MNA	SAS	SSA	Total
1990	10	2	23	5	7	20	67
1991	10	4	24	6	7	21	72
1992	11	7	25	6	7	21	77
1993	11	9	25	7	7	22	81
1994	11	11	25	7	7	24	85
1995	12	15	25	7	7	24	90
1996	13	16	26	7	7	25	94
1997	13	17	26	7	7	26	96
1998	14	21	26	7	7	28	103
1999	14	21	26	8	7	27	103
2000	13	22	26	9	7	27	104
2001	12	23	26	9	7	27	104
2002	12	23	26	9	7	26	103
2003	12	22	26	9	7	26	102
2004	12	21	26	9	7	25	100
2005	11	21	26	9	7	23	97
2006	9	19	22	6	4	7	67
2007	6	13	14	3	2	5	43
Total	206	287	443	130	118	404	1588

Regional classifications (in line with World Bank regional classifications): EAP, East Asia and Pacific; ECA, Europe and Central Asia; LAC, Latin America and the Caribbean; MNA, Middle East and Northern Africa; SAS, South Asia; SSA, Sub Saharan Africa. The income classification is the same as in the World Bank's World Development Indicators.

Table 2
Public debt composition in developing countries.

	1994				1999				2005			
	DD/Y	ED/Y	TD/Y	DD/TD	DD/Y	ED/Y	TD/Y	DD/TD	DD/Y	ED/Y	TD/Y	DD/TD
Simple average												
EAP	0.13	0.46	0.58	0.30	0.13	0.43	0.55	0.34	0.15	0.35	0.50	0.38
ECA	0.17	0.28	0.46	0.35	0.15	0.32	0.47	0.36	0.17	0.19	0.36	0.43
LAC	0.14	0.58	0.72	0.24	0.17	0.39	0.56	0.33	0.23	0.39	0.62	0.40
MNA	0.42	0.49	0.91	0.45	0.36	0.42	0.78	0.43	0.40	0.34	0.73	0.56
SAS	0.25	0.35	0.60	0.41	0.26	0.34	0.59	0.42	0.31	0.33	0.64	0.47
SSA	0.20	0.84	1.05	0.25	0.33	0.78	1.12	0.32	0.25	0.67	0.92	0.30
Total	0.19	0.55	0.75	0.30	0.22	0.47	0.69	0.35	0.23	0.40	0.64	0.40
Weighted average												
EAP	0.10	0.08	0.18	0.46	0.13	0.06	0.19	0.71	0.18	0.05	0.23	0.80
ECA	0.27	0.29	0.56	0.46	0.20	0.32	0.52	0.45	0.20	0.14	0.34	0.50
LAC	0.15	0.21	0.36	0.40	0.25	0.22	0.47	0.49	0.30	0.14	0.44	0.66
MNA	0.54	0.54	1.08	0.47	0.38	0.39	0.77	0.48	0.40	0.26	0.66	0.59
SAS	0.40	0.14	0.55	0.77	0.44	0.11	0.55	0.81	0.55	0.08	0.63	0.87
SSA	0.43	0.36	0.79	0.73	0.38	0.33	0.71	0.67	0.26	0.19	0.45	0.65
Total	0.22	0.21	0.43	0.48	0.24	0.19	0.43	0.59	0.27	0.11	0.39	0.69

The 1994 average covers 85 countries, the 1999 average covers 103 countries and the 2007 average covers 97 countries, where DD = domestic debt; ED = external debt; TD = total debt; Y = year.

domestic public debt for a large sample of countries going back to the 19th century. Their sample shows that domestic debt accounts for almost two thirds of total public debt. They also show that the accumulation of a large domestic debt is often at the roots of external debt crisis and large inflationary episode.[3] In this paper we use the data assembled by Panizza (2008) which yields lower but still substantial domestic debt share. The top panel of Table 2 shows that over the 1994–2005 period domestic public debt increased slightly from 19 to 23 per cent of developing countries' GDP. This trend occurred while average debt levels were decreasing from 75 to 64 per cent of developing countries' GDP. As a consequence, the share of domestic debt over total public debt increased from 30 to 40 per cent. The bottom panel of Table 2 reports weighted averages and shows

[3] Guidotti and Kumar (1991) study the case of 15 emerging market countries and show that their domestic public debt-to-GDP ratio went from 10 per cent in 1981 to 16 per cent in 1988. Christensen (2005) shows that low-income countries also have a tradition of domestic borrowing (in his sample of Sub-Saharan African countries, domestic public debt was about 10 per cent of GDP in 1980).

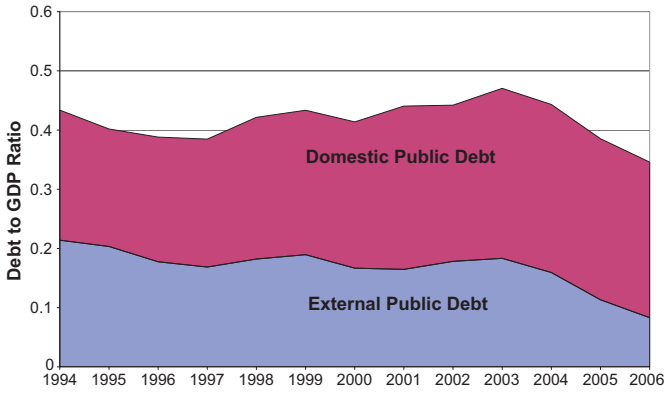

Fig. 1. Composition of public debt in developing countries, average debt to GDP. The number of countries included in the average ranges between 67 (2006) and 104 (2000–2001).

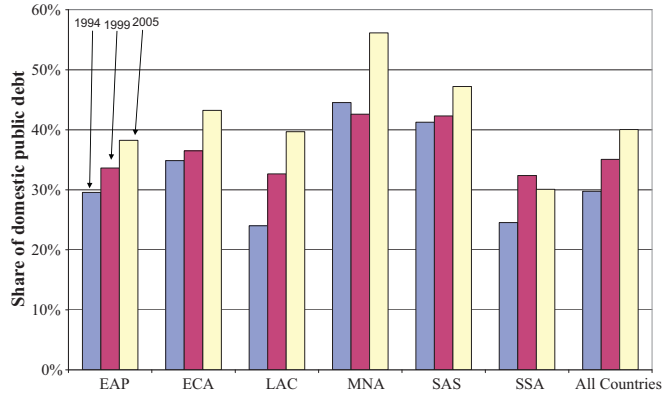

Fig. 2. Share of domestic public debt over total public debt (simple average). Simple averages vary in terms of country coverage, with the years 1994, 1999, and 2005 including 85, 103 and 97 countries, respectively.

that the switch to domestic borrowing is even more important in larger countries. In this case, the domestic debt-to-GDP ratio increased from 22 to 27 per cent, and the share of domestic debt over total debt increased from 48 to 69 per cent.

Fig. 1 plots the evolution of public debt in the developing world and shows a net decrease in total debt which is mostly driven by lower external debt. Fig. 2 shows the evolution of the simple average of the share of domestic debt over total debt across 6 regions.[4] In general, the share of domestic debt increased in most regions of the world. Only in Sub-Saharan Africa did the share of domestic debt decrease slightly over 1999–2005, but also in this region domestic debt went from 25 per cent of total public debt in 1994 to 30 per cent in 2005.

Table 3 reports summary statistics for the share of domestic debt to total debt. The top panel of the table presents the summary statistics for all available data, whereas the bottom panel presents the summary statistics for the observations used in the regressions of Section 3. By and large, the two samples have similar characteristics.[5] As already highlighted in Fig. 2 and Table 2, the Middle East & Northern Africa, East Asia & Pacific, and Europe & Central Asia are the regions with the highest shares of domestic public debt while Latin America & the Caribbean and Sub-Saharan Africa are the regions with the lowest shares of domestic debt. In examining income groups, we find that middle-income countries have an average domestic debt share of 37 per cent and low-income countries have a much lower domestic debt share of about 20 per cent. If we look across periods, we find that the share of domestic debt increased from 27 per cent in the first half of the 1990s to 35 per cent in the first six years of the 21st century.

3. The determinants of debt composition

In this section, we estimate the determinants of public debt composition by regressing domestic public debt (measured as a share of total public debt) over a set of country characteristics. We estimate our model using both random effects and fixed effects models. We also test for differences across groups of countries by splitting the sample between low-income developing countries and middle-income developing countries.

Our control variables can be classified into five different categories: (i) macroeconomic imbalances; (ii) country size and level of development; (iv) crises and external shocks; (v) openness; and (iv) exchange rate regime. The first category includes inflation, current account balance, government balance, total public debt and its square, and exchange rate misalignment. The second category includes GDP, GDP per capita, M2 over GDP, and corruption. The third category includes a banking crisis dummy, a sovereign default dummy, a dummy that captures sudden debt explosions, a dummy that captures sudden debt reductions, the growth rate of the real exchange rate, and a terms of trade index. The fourth category includes a measure of *de facto* trade openness and a measure of *de jure* capital account openness.[6] Finally, in all regressions we control for global factors by including year fixed effects. In the random effects regressions we also include a set of regional dummies, where East Asia & Pacific is the excluded dummy.

Before describing our set of explanatory variables in greater detail, we should clarify that there are at least two caveats in our analysis. The first caveat concerns causality. Although we use lagged values of the explanatory variables and thus ensure that these are *predetermined* with respect to debt composition, we cannot make any claim that our estimations uncover a *causal* relationship going from the explanatory variables to debt composition. The second caveat relates to the fact that supply and

[4] Regions are broken down by World Bank regional classifications, which includes: East Asia and Pacific (EAP);Europe and Central Asia (ECA); Latin America and the Caribbean (LAC); Middle East and Northern Africa (MNA); South Asia (SAS), Sub Saharan Africa (SSA).

[5] The only differences are in the ECA and SAS regions and in the 2000–2006 sub-periods. In these three groups we find that the sub-samples included in the regressions have slightly higher domestic debt shares (with differences that range between 2 and 3 percentage points).

[6] We measure the exchange rate regime using the *de facto* indicators assembled by Levy et al. (2005) and use a dummy that takes value one in countries with a fixed exchange rate regime and a dummy that takes value one in counties with an intermediate exchange rate regime (floating exchange rate is the excluded dummy).

Table 3
Summary statistics: domestic debt/total debt.

Group	μ (%)	σ (%)	Median (%)	Min (%)	Max (%)	*N*. of observations
Panel A: all observations						
All countries	31.93	24.56	27.48	0	100	1588
By region						
EAP	37.38	31.98	35.90	0	93.68	206
ECA	35.98	23.41	32.58	0	97.32	287
LAC	27.48	20.05	25.60	0	87.30	443
MNA	41.93	21.71	38.79	3.04	91.53	130
SAS	34.34	13.77	36.01	1.71	56.95	118
SSA	27.56	26.29	18.96	0	100	404
By income groups						
Middle-income	37.29	24.88	34.50	0	98.39	1084
Low-income	20.37	19.34	15.96	0	100	504
By period						
1990–1995	27.04	23.87	22.12	0	98.39	472
1996–2000	32.02	24.21	27.54	0	100	504
2000–2006	35.03	24.73	30.60	0	100	572
Panel B: observations included in the regressions						
All countries	32.30	24.45	28.18	0	100	1122
By region						
EAP	37.30	31.09	35.79	0	91.40	129
ECA	38.94	23.41	36.66	0	93.84	203
LAC	27.75	20.45	25.66	0	87.30	368
MNA	41.93	18.02	40.78	11.59	80.47	67
SAS	37.13	12.28	41.27	1.85	56.95	66
SSA	27.89	27.50	17.35	0	100	289
By income groups						
Middle-income	37.60	24.59	35.57	0	98.39	798
Low-income	19.26	18.51	15.00	0	100	324
By period						
1990–1995	26.32	22.64	22.40	0	98.39	305
1996–2000	32.03	24.36	27.46	0	100	391
2000–2006	37.06	24.88	32.15	0	100	351

demand effects often go in opposite directions. Thus, it is hard to have a clear prediction on the relationship between our explanatory and dependent variables. Even with these caveats in mind, in some cases it should be possible to indicate which effects are expected to prevail and we will do so whenever possible. It is also important to acknowledge that even though our data can only distinguish between domestic and external debt and do not contain any information on currency composition, we will often justify our choice of explanatory variables using arguments based on currency composition. We do this because the share of domestic currency instruments in domestic debt is substantially higher than the domestic currency share of external debt, in fact the latter is often zero (see Eichengreen et al., 2005). Thus, place of issuance is often a good proxy for currency composition, though this is not always the case (see Panizza, 2008).

Our main measure of macroeconomic instability is log of inflation ($Ln(INF)$).[7] There are two reasons why we expect a negative relationship between inflation and domestic debt share.[8] First, high inflation increases uncertainty which, other things equal, should increase the cost of issuing on the domestic market (unless all domestic debt is indexed to either prices or foreign currency).[9] Second, a government with a history of high inflation may need to issue foreign currency debt in order to credibly signal its commitment to pursuing a strong and stable monetary policy (Calvo, 1988). There are also mechanisms that may lead to a positive correlation between inflation and domestic debt share. Think, for instance, of a country that is facing a real appreciation (i.e., where inflation is higher than currency depreciation) and where a large share of domestic debt is indexed to inflation. In this case, valuation effects will create a positive link between inflation and domestic currency debt. We believe this to be a fairly exceptional case and so expect that, in the absence of financial repression, the first two effects will dominate the latter. In fact Burger and Warnock (2006) and the other authors quoted in the introduction all find a negative correlation between inflation and the development of the domestic bond market.

The relationship between current account balance (*CA/GDP*) and domestic debt share should be straightforward because countries that are running a current account surplus do not

[7] We use logs in order to be able to interpret the results as semi-elasticities. In order to deal with negative values we use the transformation LINF = Ln(1 + INF).

[8] Burger and Warnock (2006) and the other authors quoted in the introduction find that a history of high inflation is detrimental for the development of the domestic bond market.

[9] Even in this case, inflation can debase debt indexed to prices if the government tinkers with the price index.

need to borrow abroad. Hence, we expect a positive relationship between domestic debt share and current account balance. The relationship between domestic debt share and the government balance (GBAL/GDP) is uncertain. On the supply side, countries which are running large deficits and have limited access to the international capital market may need to issue more domestic debt. On the demand side, large deficits may lead to inflationary pressure (Sargent and Wallace, 1981), reduce credibility, and thus reduce the demand for domestic currency debt.

The relationship between the level of debt (DEBT/GDP) and domestic debt share is also uncertain but we expect a positive and non-linear relationship between these two variables. Countries with a larger stock of debt will have more of an incentive to create the plumbing for a well-working market for domestic debt. However, when debt becomes too large, countries will have incentives to inflate away their debt obligations and this may have an adverse effect on the demand for domestic debt.

Exchange rate misalignments (RER_MIS) also have opposite demand, supply, and valuation effects. On the demand side, at any given interest rate, a depreciated exchange rate *vis-à-vis* its equilibrium level is likely to foster the demand of domestic currency bonds as investors may foresee an ex-post deterioration of the foreign currency rate (a real appreciation of local currency). On the supply side, governments might be less likely to issue in domestic currency in presence of a depreciated exchange rate for the same reason why investors are interested in domestic bonds. Clearly, these considerations are valid for any given interest rates. However, if expectations on future movements of the exchange rate are symmetric, we should expect Uncovered Interest Parity (UIP) to hold. In this case, the interest rate would adjust to equalize expected returns on domestic and foreign currency debt. Even if UIP holds, countries may find easier to issue domestic debt when the currency is appreciating because the expected appreciation allows prudent policymakers to hide the implicit insurance premium embedded in domestic currency borrowing (Caballero and Cowan, 2006; Panizza, 2008). However, UIP does not normally hold in practice and activities such as carry trade can lead to a situation in which currency appreciation goes hand in hand with high interest rates. Finally, an appreciating exchange rate will automatically lead to higher domestic debt share through valuation effects.

The expected signs for our second set of explanatory variables are unambiguous. In particular, we expect country size (measured by the log of total GDP, Ln(GDP), GDP per capita (Ln(GDP_PC), the size of the financial system (M2/GDP), and institutional quality (measured by the lack of corruption, CORR) to be positively correlated with domestic debt share.

The effect of crises and external shocks is, instead, uncertain. Banking crises are often resolved by issuing domestic bonds. This suggests a positive correlation between the banking crisis dummy (BANKCRS) and the share of domestic debt. However, countries with a small financial sector may not be able to place domestically the large amount of debt which may be necessary to bail out the banking system. Thus, banking crises could be positively correlated with domestic debt share in middle-income countries with bigger financial sectors and negatively correlated with domestic debt share in low-income countries with smaller financial sectors.

As countries in default are generally unable to place external debt, we should find a positive correlation between the default dummy (DEFAULT) and domestic debt share. However, as defaults are often preceded by large accumulations of external debt, it is possible that reverse causality will lead us to find a negative relationship between these two variables. Sudden debt contractions are often driven by debt relief and debt rescheduling. Since most relief and rescheduling episodes relate to external debt, we expect a positive relationship between the debt contraction (DEBTCONTR) dummy and domestic debt share. Sudden debt explosions are often driven by valuation effects linked to currency depreciations (Campos et al., 2006) and by skeletons. The first effect would lead to a decrease in the domestic debt share and the second is usually associated with an increase in the domestic debt share, skeletons are often dealt with by issuing domestic bonds (see Fernandez et al., 2008, for a discussion of the case of Argentina). As we are already controlling for the first effect by including the change of the real exchange rate (DRER), which we expect to be negatively correlated with domestic debt share), we expect to find that the debt explosion (DEBTEXPL) dummy is positively correlated with domestic debt share. As positive external shocks reduce the need of external resources and hence we expect to find a positive correlation between terms of trade (DTOT) and domestic debt share.

Finally, we do not have clear expectations for the relationship between domestic debt share and the two measures of openness. Let us start with trade openness. On the one hand, more open countries suffer less from balance sheets effects associated with external borrowing (Calvo et al., 2003) and thus we should expect a negative relationship between trade openness and domestic debt share. On the other hand, more open countries may be more successful in attracting foreign investors into the domestic financial market, bringing about a positive association between trade openness and domestic debt share. The first effect may be dominant in low-income countries whereas the second is likely to dominate in emerging markets.[10] In the case of financial openness we have a similar trade-off. On the one hand, financial repression may foster demand for domestic debt by creating a captive investor base (for a description of financial repression in a large sample of countries over a period of more than 100 years, see Reinhart and Sbrancia, 2011). On the other hand, such a policy prevents the participation of foreign investors in the domestic market. It is thus possible that financial repressions has a negative effect on the development of the domestic debt market in countries with high credibility and a positive effect in countries with low credibility.

[10] This discussion does not fit the official definition of external debt because debt issued domestically but sold to foreign investors should be classified as external debt. However, few countries do this and usually they classify all debt issued on the domestic market as domestic debt (see Panizza, 2008; Cowan et al., 2005).

Table 4
Random effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	ALL developing count.		Low-income		Middle-income	
$Ln(INF)_{t-1}$	0.261	−0.492	−0.953	−2.441	0.545	−0.326
	(0.44)	(0.86)	(0.67)	(0.85)	(0.68)	(0.64)
CA/GDP_{t-1}	2.299	13.788	1.187	58.849	9.586	19.712
	(0.45)	(0.95)	(0.12)	(1.05)	(0.69)	(1.18)
$BANKCRIS_{t-1}$	−0.265	−0.235	−9.210	−6.205	0.322	0.399
	(0.16)	(0.17)	(2.75)***	(0.72)	(0.16)	(0.25)
$DEFAULT_{t-1}$	−0.595	0.462	−0.274	−0.166	−1.168	0.246
	(0.29)	(0.23)	(0.07)	(0.03)	(0.46)	(0.10)
$M2/GDP_{t-1}$	6.918	4.797	77.762	95.388	1.860	4.444
	(1.05)	(0.91)	(3.39)***	(2.26)**	(0.29)	(0.85)
$Ln(GDP)_{t-1}$	0.042	0.040	0.210	−1.455	0.046	0.045
	(3.90)***	(3.50)***	(1.41)	(0.90)	(5.14)***	(4.49)***
$Ln(GDP\_PC)_{t-1}$	8.155	14.119	12.311	9.792	5.438	18.925
	(1.61)	(2.28)**	(2.12)**	(1.44)	(0.72)	(2.43)**
$DEBT/GDP_{t-1}$	6.939	19.907	−0.685	−40.939	14.356	22.734
	(2.07)**	(4.18)***	(0.08)	(1.00)	(2.67)***	(3.53)***
$(DEBT/GDP)^2_{t-1}$	−1.061	−3.485	0.110	15.179	−2.843	−3.898
	(2.25)**	(3.13)***	(0.08)	(1.26)	(2.53)**	(2.79)***
DRER	−9.768	−6.312	−19.036	−21.668	−11.345	−6.187
	(3.12)***	(1.37)	(2.38)**	(1.32)	(2.34)**	(1.20)
$OPEN_{t-1}$	−0.026	−0.003	−0.213	−0.272	0.006	−0.002
	(0.50)	(0.04)	(2.93)***	(2.32)**	(0.09)	(0.03)
CORR	8.704	6.509	−6.463	−21.255	11.779	3.995
	(1.60)	(0.99)	(1.02)	(0.99)	(1.80)*	(0.56)
DEBTCONTR	−1.224	−1.564	9.257	10.501	−1.878	−2.652
	(0.67)	(0.80)	(1.59)	(1.12)	(1.03)	(1.42)
DEBTEXPL	4.692	5.715	4.103	4.332	4.191	4.015
	(3.70)***	(4.02)***	(0.88)	(0.41)	(2.83)***	(2.80)***
FIX_{t-1}		−1.403		5.820		−1.906
		(0.91)		(0.55)		(1.14)
INT_{t-1}		−1.656		3.312		−1.669
		(1.20)		(0.64)		(1.10)
$CAPCON_{t-1}$		0.677		−1.333		0.958
		(1.93)*		(1.07)		(2.89)***
$GBAL/GDP_{t-1}$		−0.240		−0.500		−0.056
		(1.00)		(0.52)		(0.22)
TOT_{t-1}		−0.023		0.379		−0.042
		(0.41)		(1.95)*		(0.55)
RER_MIS_{t-1}		−7.550		4.299		−5.772
		(1.88)*		(0.16)		(1.70)*
ECA	−6.779	−14.695	10.776	30.853	−17.454	−22.692
	(0.80)	(1.54)	(1.82)*	(2.30)**	(1.65)*	(2.46)**
LAC	−14.804	−24.789	−15.960	6.467	−25.699	−31.842
	(1.96)*	(2.64)***	(1.60)	(0.24)	(2.90)***	(3.95)***
SAS	6.068	6.789	−7.767	69.313	−1.042	1.724
	(0.80)	(0.72)	(1.00)	(1.00)	(0.11)	(0.20)
SSA	−3.247	−5.861	8.085	26.498	−14.435	−13.692
	(0.39)	(0.54)	(1.43)	(1.23)	(1.12)	(1.14)
MNA	−5.544	−19.175	0.000	0.000	−15.812	−24.929
	(0.52)	(1.70)*	(.)	(.)	(1.49)	(2.62)***
Constant	−36.257	−77.923	−81.036	−77.213	−9.020	−116.733
	(0.91)	(1.39)	(1.73)*	(1.33)	(0.15)	(1.67)*
Observations	1107	733	324	152	783	581
N. of countries	95	74	33	22	62	52
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust *t*-statistics in parentheses (standard errors are clustered at the country level).
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

4. Results

We start by describing the results of a random effects model which can jointly capture cross-country and within country determinants of debt composition and then discuss what happens when we move to a fixed effects model. For each group of countries and estimation technique, we estimate the model using the full set of controls but also use a subset of controls which allows for a larger sample of countries.

4.1. Random effects estimations

As expected, we find that in most regressions inflation has a negative coefficient, indicating that lack of monetary credibility is an obstacle to developing the market for domestic public debt (the exceptions are columns 1 and 5 of Table 4). However, we find that the coefficients are never statistically significant. This is surprising because one common finding of the existing literature is the presence of a strong and negative correlation between past inflation and the development of the domestic bond market.[11] In the next subsection we will investigate in greater detail why we do not find a statistically significant relationship between inflation and domestic debt share.

As expected, the current account balance has always a positive coefficient, indicating that countries that are running a current account surplus do not need to borrow abroad. However, as in the case of inflation, the coefficient is never statistically significant. We also find that the government balance has a negative coefficient. This is consistent with our hypothesis that developing countries tend to issue more domestic debt – relative to external debt – when they have budgetary problems. But, again, the coefficient is not statistically significant.

The relationship between domestic debt share and total public debt is non-linear and concave in the full sample and in the sub sample of middle-income countries, but convex and not statistically significant in the sub sample of low-income countries. A concave relationship between total public debt and domestic debt share is consistent with the hypothesis that, at lower levels of public debt, increases in the stock of debt have a positive impact over the share of domestic debt due to its role in developing the debt market. However, higher levels of debt may lead to sustainability problems and increase the incentives to inflate away the debt and thus reduce the demand for domestically issued debt. It is worth noting that our point estimate suggests that the relationship between domestic debt share and total public debt only becomes negative when total public debt reaches 300 per cent of GDP (in column 1 of Table 4, the level of debt that maximizes the domestic debt share is $6.9/(2 \times 1.061) = 3.27$.

The variable measuring the misalignment of the real exchange rate has a negative and statistically significant coefficient (except in low-income countries). Thus, we find that the share of domestic debt decreases when the real exchange rate is above its long-run trend. This fact is consistent with the presence of long-term currency misalignments which, in turn, may be sustained by speculative activities such as carry trade.

Focusing on the second group of variables, we find the expected results that country size and the level of development are positively correlated with domestic debt share. However, the coefficients are not always statistically significant. In particular, we find that, on average, larger countries (as measured by total GDP) tend to have larger domestic debt shares, but this result does not hold for low-income countries. GDP per capita has a positive impact over domestic debt share and its coefficient is statistically (or close to being statistically significant) in most regressions. Our proxy for financial development, M2 over GDP, is positive in all cases but only significant in low-income countries.[12] In most cases, institutional quality (measured as lack of corruption) has a positive impact on domestic debt share but the coefficients are rarely statistically significant.

The group of variables aimed at capturing crises and external shocks also give mixed results. The sovereign default and banking crisis dummies are rarely significant and switch sign across samples. However, we do find the expected result that low-income countries tend to finance banking crises by issuing external debt and middle-income countries finance banking crises by issuing more domestic debt. In the latter case, however, the coefficients are not even close to being statistically significant. With respect to the sovereign default dummy, we find that the coefficient is never statistically significant, a fact that is probably driven by reverse causality. As expected, we find that currency depreciations have a negative effect on domestic debt share, indicating the presence of balance sheet effects. The effect is not significant in columns 2, 4, or 6. This may be due to the fact that in these columns we also control for exchange rate misalignments, a variable which is positively correlated with the change in the real exchange rate (DRER).

The dummy variable capturing sudden debt contractions is negative and not statistically significant in the whole sample and in the sub sample of middle-income countries but is positive (and close to being statistically significant in column 3) in the sub sample of low-income countries. The results for low-income countries confirm our prior that sudden debt contractions are driven by debt relief episodes, the results for middle-income countries are instead puzzling. The dummy variable associated with debt explosion is positive and often significant (the exception is the sub sample of low-income countries where the coefficients are not statistically significant). This indicates that, once valuation effects are controlled for, debt explosions are mostly driven by skeletons which are financed by issuing domestic debt. As expected, terms of trade shocks are positively correlated with the domestic debt share, indicating that an improvement in the terms of trade reduce the needs of external borrowing.[13]

[11] See Burger and Warnock (2006) and the other papers mentioned in the introduction.

[12] This is in contrast with the results of Borensztein et al. (2008) who find a close correlation between the development of the banking system and that of the domestic bond market.

[13] Moreover, if countries are trying to stabilize their exchange rate, a positive term of trade shock and the associated current account surplus often translates

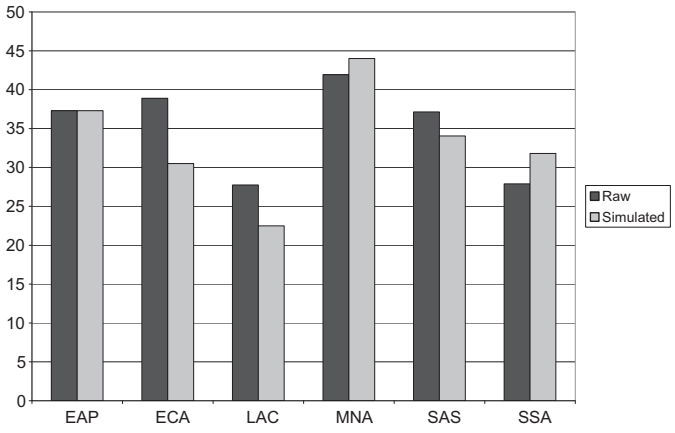

Fig. 3. Raw and adjusted domestic debt shares.

The effects of the two measures of openness differ across country groups. In low-income countries, both trade openness and capital account openness have a negative effect on domestic debt share (but only trade openness is statistically significant). In middle-income countries, instead, both openness variables are positively correlated with domestic debt share (although the coefficient of trade openness is almost zero and not even close to being statistically significant). These differential effects are consistent with the fact that in middle-income countries openness favors the entry of foreign investors, which is not the case in low-income countries. We find that the exchange rate regime has no statistically significant effect on domestic debt share.

We can use the regional dummies to decompose regional differences in the share of domestic debt into a part that can be explained by our set of independent variables and an unexplained part. The results of this decomposition are somewhat surprising as they indicate that country characteristics do a very poor job at explaining regional differences in domestic debt shares. In particular, we can use Table 4 to simulate what would happen to domestic debt share if each region had the same average country characteristics of the East Asia and Pacific region (we choose this region as a benchmark because it is the region that has made the biggest effort to develop the domestic bond market, see Eichengreen et al., 2006). We do this in Fig. 3. The dark bars report the "raw" share of domestic debt (from Panel B of Table 3) and the light bars represent the simulated share (by construction the two bars have equal height in the EAP region). The only region in which country characteristics explain a substantial share of the regional difference is Sub Saharan Africa. In this case, the point estimates suggest that if countries in Sub Saharan Africa had the same characteristics as countries in East Asia, their share of domestic debt would increase by 4 percentage points, reducing the difference with East Asia by almost 50 per cent. In all other cases, assuming the characteristics of the average East Asian country would lead to an *increase* in the difference between each region's share of domestic debt and the share of domestic debt in East Asia. The most striking examples are Europe & Central Asia and Latin America & the Caribbean. Europe & Central Asia has a share of domestic debt which is slightly larger than that of East Asia & Pacific (38.9 per cent versus 37.3 per cent). However, if we were to assign to Europe & Central Asian countries the characteristics of the average East Asia & Pacific country, the share of domestic debt in Europe & Central Asia would drop by 8.5 percentage points and, at 30 per cent, would become much lower than that of East Asia. In the case of Latin America & the Caribbean, the raw differential is almost 10 percentage points (37.3 per cent versus 27.8 per cent), but the simulated differential is close to 15 percentage points (37.3 per cent versus 22.5 per cent). This suggests that country characteristics (or at least, the ones that we are able to capture in our econometric model) do not seem to play a role in explaining the fact that governments in Latin America & the Caribbean borrow abroad much more than governments in East Asia & the Pacific.[14]

4.2. Fixed effects estimations

Table 5 estimates a set of specifications similar to those of Table 4 by using a fixed effects model. While the random effects estimations can be interpreted as jointly capturing cross-country and within-country differences, fixed effects estimations focus on within-country differences and, at the cost of a higher noise to signal ratio, allow to fully control for all time-invariant country-specific factors. Thus fixed effects estimates should be interpreted as an indication of whether within-country changes in country characteristics are associated with within-country changes in domestic debt share.[15] We find that the two estimation techniques yield similar results. The main difference is that we now find a much stronger effect of total GDP (statistically significant in 5 regressions and close to being significant in the sixth), indicating that GDP growth is positively associated with increases in domestic debt share (as we measure GDP in nominal US dollars, this may be due to valuation effects). We find that the effect of debt level is statistically significant and concave in all subsamples. In the case of low-income countries there are statistically significant domestic market-promoting effects of capital controls and budget deficits. Finally, we now find no significant relationship between trade openness and share of domestic debt. As before, we find that there is no statistically significant relationship between inflation and domestic debt share.

In Table 6, we use STATA's robust regression estimator to check whether or results are driven by outliers.[16] The main differences with respect to the estimations of Table 5 concern the

into a net accumulation of international reserves and the need to issue domestic securities in order to sterilize the liquidity created through reserve accumulation.

[14] The coefficients of the regional dummies in column 2 of Table 4 are even larger, indicating that including more controls does not change the situation.

[15] In the fixed effect estimates we do not control for corruption and GDP per capita. The first exclusion is due to the fact that we do not have annual data for corruption, the second exclusion is due to the fact that within country changes of GDP per capita are highly correlated with within country changes in total GDP.

[16] In particular, we use rreg in STATA. This command estimates a robust regression using iteratively reweighed least squares. Extreme outliers with Cook's D greater than 1 are assigned a weight of zero.

Table 5
Fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	ALL developing count.		Low-income		Middle-income	
$Ln(INF)_{t-1}$	0.166	−0.589	−0.610	−0.747	0.440	−0.483
	(0.38)	(1.41)	(1.25)	(0.70)	(0.71)	(1.08)
CA/GDP_{t-1}	2.683	8.675	−0.787	23.634	9.705	14.045
	(0.73)	(0.84)	(0.22)	(0.82)	(1.17)	(1.19)
$BANKCRIS_{t-1}$	−0.438	−0.372	−2.325	−7.147	−0.044	0.238
	(0.42)	(0.30)	(1.57)	(2.02)**	(0.03)	(0.17)
$DEFAULT_{t-1}$	−0.632	0.072	−0.828	−0.339	−0.898	0.388
	(0.53)	(0.06)	(0.31)	(0.10)	(0.65)	(0.29)
$M2/GDP_{t-1}$	8.143	7.014	18.367	−12.613	3.919	8.602
	(2.09)**	(1.61)	(1.77)*	(0.58)	(0.93)	(1.95)*
$Ln(GDP)_{t-1}$	0.040	0.040	1.150	0.849	0.043	0.047
	(4.85)***	(4.86)***	(5.26)***	(1.43)	(4.80)***	(5.44)***
$DEBT/GDP_{t-1}$	5.527	18.129	7.738	44.977	12.227	20.107
	(2.98)***	(6.05)***	(3.00)***	(3.52)***	(3.58)***	(5.10)***
$(DEBT/GDP)^2_{t-1}$	−0.846	−3.087	−1.092	−12.781	−2.326	−3.212
	(2.79)***	(4.57)***	(3.09)***	(3.45)***	(3.43)***	(4.18)***
DRER	−9.637	−6.499	−9.524	8.188	−11.395	−7.169
	(3.27)***	(1.51)	(2.42)**	(1.09)	(2.80)***	(1.47)
$OPEN_{t-1}$	0.003	0.048	−0.019	−0.095	0.031	0.053
	(0.10)	(1.18)	(0.48)	(1.15)	(0.82)	(1.20)
DEBTCONTR	−0.883	−1.373	2.650	10.681	−1.411	−2.449
	(0.51)	(0.71)	(0.57)	(1.92)*	(0.77)	(1.28)
DEBTEXPL	4.737	5.787	6.259	16.037	4.170	4.260
	(3.64)***	(3.81)***	(2.63)***	(4.53)***	(2.77)***	(2.67)***
FIX_{t-1}		−0.833		−3.818		−0.681
		(0.69)		(1.29)		(0.51)
INT_{t-1}		−1.700		−2.583		−1.615
		(1.95)*		(1.08)		(1.73)*
$CAPCON_{t-1}$		0.786		−1.755		1.073
		(2.90)***		(2.58)**		(3.91)***
$GBAL/GDP_{t-1}$		−0.187		−0.895		0.089
		(1.09)		(2.10)**		(0.51)
TOT_{t-1}		−0.003		−0.089		−0.004
		(0.08)		(1.71)		(0.09)
RER_MIS_{t-1}		−6.953		−32.437		−4.700
		(2.28)**		(3.52)***		(1.68)*
Constant	29.821	12.914	5.697	29.065	14.698	13.429
	(7.82)***	(2.06)**	(1.28)	(1.97)*	(2.92)***	(1.67)*
Observations	1122	734	324	152	798	582
N. of countries	97	74	33	22	64	52
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust *t*-statistics in parentheses.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

inflation, banking crisis, and openness variables. As before, we find that inflation is rarely statistically significant (except for column 4), but we now find that in half of the cases the coefficient is *positive, which is* the opposite of what we expected. In the case of banking crises, we now find a negative and statistically significant coefficient in middle-income countries, indicating that countries with market access try to borrow abroad in order to finance the resolution of a banking crisis. This is the opposite of what we found in our random effects estimations. With respect to trade openness, we now find a positive coefficient in column 4 and a negative coefficient in column 3. We checked whether this difference in results is driven by the additional controls or by the smaller sample of column 4 and find that the result is driven by the smaller sample and not by the presence of additional controls.

4.3. Probing further

The results discussed above are surprising as they indicate that most of our independent variables have limited ability to explain cross-country and within-country differences in domestic debt share. However, the most puzzling finding is that we have not been able to identify a robust and statistically significant link between inflation and domestic debt share. In this section we explore possible reasons for this puzzling result.

Table 6
Fixed effects. Robust regression.

	(1)	(2)	(3)	(4)	(5)	(6)
	ALL developing count.		Low-income		Middle-income	
$Ln(INF)_{t-1}$	0.006	−0.012	0.305	1.238	−0.302	−0.252
	(0.02)	(0.03)	(1.15)	(2.32)**	(0.76)	(0.53)
CA/GDP_{t-1}	1.112	6.929	−2.811	−23.515	2.913	8.874
	(0.33)	(0.88)	(1.24)	(1.92)*	(0.41)	(0.96)
$BANKCRIS_{t-1}$	−2.383	−1.733	−0.993	1.248	−2.616	−2.289
	(2.76)***	(1.61)	(1.04)	(0.61)	(2.37)**	(1.86)*
$DEFAULT_{t-1}$	0.543	−0.907	−3.348	−1.442	0.373	−0.948
	(0.56)	(0.81)	(3.10)***	(0.92)	(0.30)	(0.72)
$M2/GDP_{t-1}$	11.244	5.323	9.081	6.099	8.339	6.715
	(3.73)***	(1.46)	(1.76)*	(0.53)	(2.36)**	(1.72)*
$Ln(GDP)_{t-1}$	0.046	0.043	0.808	0.921	0.048	0.052
	(6.17)***	(5.53)***	(6.55)***	(2.35)**	(5.68)***	(6.14)***
$DEBT/GDP_{t-1}$	3.289	14.069	3.378	11.034	12.116	19.683
	(1.96)*	(4.86)***	(2.68)***	(1.73)*	(3.75)***	(5.46)***
$(DEBT/GDP)^2_{t-1}$	−0.565	−2.777	−0.466	−4.454	−2.228	−3.301
	(1.86)*	(3.34)***	(2.19)**	(2.21)**	(2.44)**	(3.52)***
DRER	−4.311	−4.160	−0.902	3.417	−7.195	−8.496
	(1.70)*	(1.22)	(0.42)	(0.71)	(1.97)**	(2.03)**
$OPEN_{t-1}$	0.001	0.066	−0.042	0.090	0.005	0.038
	(0.04)	(2.46)**	(2.43)**	(2.30)**	(0.17)	(1.18)
DEBTCONTR	−2.296	−2.532	3.554	−2.540	−2.103	−3.225
	(2.06)**	(2.00)**	(2.06)**	(0.79)	(1.61)	(2.35)**
DEBTEXPL	3.693	4.872	1.683	7.127	3.857	3.480
	(3.63)***	(4.15)***	(1.58)	(3.69)***	(2.94)***	(2.59)***
FIX_{t-1}		−0.949		2.072		−0.786
		(0.94)		(1.34)		(0.65)
INT_{t-1}		−1.221		0.216		−1.027
		(1.62)		(0.17)		(1.23)
$CAPCON_{t-1}$		0.515		−0.842		0.682
		(2.58)**		(1.97)*		(3.12)***
$GBAL/GDP_{t-1}$		−0.055		−0.025		0.014
		(0.45)		(0.15)		(0.09)
TOT_{t-1}		0.011		−0.012		0.038
		(0.37)		(0.36)		(0.99)
RER_MIS_{t-1}		−4.336		−9.505		−2.396
		(2.41)**		(1.96)*		(1.21)
Constant	−29.819	−20.462	−5.848	−32.662	−17.823	−32.098
	(3.12)***	(2.94)***	(0.94)	(1.47)	(1.52)	(3.04)***
Observations	1122	733	324	152	798	581
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust *t*-statistics in parentheses.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

One possible explanation for this finding is reverse causality (governments that put little weight on the cost of inflation may want to issue more domestic debt because this debt is easier to dilute with inflation). While we cannot directly test for this hypothesis because we do not have a good instrument for inflation, we suspect that the standard effect (i.e., limited demand for domestic debt instruments in presence of a history of high inflation) should dominate any effect that may drive a positive correlation between inflation and domestic debt share. In fact, all the papers surveyed in the introduction find that inflation has a negative effect on the development of the domestic bond market.

Another possibility is multicollinearity. By including up to 18 controls in our model we may have been too ambitious in trying to separate different effects of macro stability. Inflation is correlated with several explanatory variables in our list and our regressions may not be powerful enough to capture the individual effects all of these variables. In Table 7, we address this issue by using a more parsimonious set of controls and we still find the same results of inflation being positively (albeit, not significantly) correlated with domestic debt share and, again, we find that the only variables which are robustly correlated with domestic debt share are country size, level of debt, and currency depreciations. Another possibility is that inflation captures differences in domestic debt share across regions but not within regions. To check this hypothesis, we re-estimated Table 4 by dropping the regional dummies. Our basic results remain

Table 7
Panel regressions with reduced set of controls.

	Random effects		Fixed effects	
	(1)	(2)	(1)	(2)
	All developing count.	Middle-income	All developing count.	Middle-income
$Ln(INF)_{t-1}$	0.271	0.509	0.172	0.394
	(0.47)	(0.65)	(0.40)	(0.67)
CA/GDP_{t-1}	3.097	7.668	2.552	8.248
	(0.73)	(0.64)	(0.82)	(1.14)
$M2/GDP_{t-1}$	6.360	3.795	7.087	5.083
	(0.98)	(0.54)	(1.89)*	(1.23)
$Ln(GDP)_{t-1}$	0.043	0.046	0.041	0.045
	(4.43)***	(5.20)***	(5.16)***	(5.22)***
$Ln(GDP\_PC)_{t-1}$	9.882	8.032		
	(2.36)**	(1.09)		
$DEBT/GDP_{t-1}$	6.268	12.677	4.555	11.062
	(1.93)*	(2.42)**	(2.55)**	(3.50)***
$(DEBT/GDP)^2_{t-1}$	−0.963	−2.453	−0.697	−1.999
	(2.08)**	(2.25)**	(2.49)**	(3.31)***
DRER	−5.155	−8.491	−6.059	−9.489
	(2.36)**	(1.98)**	(2.78)***	(2.52)**
ECA	−2.223	−8.730		
	(0.26)	(0.71)		
LAC	−10.113	−17.629		
	(1.33)	(1.66)*		
SAS	9.861	5.125		
	(1.29)	(0.45)		
SSA	0.637	−4.173		
	(0.07)	(0.28)		
MNA	1.388	−6.292		
	(0.13)	(0.52)		
Constant	−51.699	−30.091	30.795	32.375
	(1.45)	(0.46)	(10.94)***	(9.36)***
Observations	1130	796	1139	805
N. of countries	96	63	97	64
Year fixed effects	Yes	Yes	Yes	Yes

Robust *t*-statistics in parentheses.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

unchanged. We also found the same when we estimated the model by dropping year fixed effects.

Another possibility is that by using annual data we are unable to capture the medium or long-term relationship between monetary credibility and domestic debt share. To address this issue, we re-estimate our panel regression using three-year averages instead of annual data but we still find that there is no statistically significant relationship between domestic debt share and inflation (Table 8). Next, we move to purely cross-sectional data and we find a negative and statistically significant relationship between inflation and domestic debt share when we compute averages for the 1990–2005 period, but we do not find any significant relationship between these variables when we examine any other sub period (Table 9).

Summing up, we find a significant relationship between inflation and domestic debt share only when we use cross-sectional data and averages over a 15 year period. Even in this case, we obtained the result only by dropping two outliers, if these two outliers are not excluded, the relationship between inflation and domestic debt share remains insignificant even in the 1990–2005 sample.

In the previous section, we mentioned that in presence of financial repression, the government could force domestic investors to buy government paper even if this yields a low real return. If this were the case, we should find a positive relationship between inflation and domestic debt share in countries with high levels of capital controls and a negative relationship between inflation and domestic debt share in countries with low levels of capital controls. We can test this hypothesis by substituting our continuous measure of capital controls with a discrete measure that takes the value of one in countries with high level of capital controls (we define all country-year with an index below 3 as having high capital controls; where 3 is the 33rd percentile of the capital control index) and then interact this variable with inflation.[17] Formally, we estimate the following model:

[17] We could have done the same using the continuous measure of capital controls but there results would have been more difficult to interpret.

Table 8
Panel estimations, 3-year averages.

	Random effects		Fixed effects		Fixed effects, robust	
	(1)	(2)	(3)	(4)	(5)	(6)
	All Developing Countries					
$Ln(INF)_{t-1}$	1.043	−0.768	0.924	−0.601	−0.335	−0.843
	(0.95)	(0.67)	(0.91)	(0.55)	(0.55)	(0.99)
CA/GDP_{t-1}	14.321	42.443	17.145	35.464	10.500	9.967
	(1.27)	(1.61)	(1.74)*	(1.40)	(1.41)	(0.63)
$BANKCRIS_{t-1}$	−1.435	−1.513	−1.555	−1.501	−1.846	0.607
	(0.82)	(0.91)	(0.88)	(0.74)	(1.32)	(0.36)
$DEFAULT_{t-1}$	0.512	1.537	0.611	1.543	1.021	−0.692
	(0.24)	(0.75)	(0.32)	(0.84)	(0.68)	(0.43)
$M2/GDP_{t-1}$	4.654	5.150	4.255	3.887	11.535	4.751
	(0.64)	(0.82)	(0.54)	(0.54)	(2.11)**	(0.76)
$Ln(GDP)_{t-1}$	0.058	0.049	0.062	0.052	0.056	0.050
	(4.44)***	(3.75)***	(3.40)***	(3.11)***	(3.85)***	(3.22)***
$Ln(GDP\_PC)_{t-1}$	10.298	12.530				
	(2.03)**	(1.97)**				
$DEBT/GDP_{t-1}$	8.516	18.575	8.216	20.954	7.756	19.184
	(1.85)*	(3.31)***	(1.81)*	(3.93)***	(2.04)**	(3.64)***
$(DEBT/GDP)^2_{t-1}$	−1.737	−2.663	−1.636	−2.908	−1.411	−3.634
	(1.80)*	(2.13)**	(1.64)	(2.22)**	(1.50)	(2.29)**
DRER	−11.123	−2.686	−9.977	−1.294	0.471	2.278
	(1.88)*	(0.39)	(1.46)	(0.18)	(0.08)	(0.31)
$OPEN_{t-1}$	0.013	−0.038	0.080	0.052	0.022	0.134
	(0.24)	(0.61)	(1.54)	(0.72)	(0.69)	(2.85)***
CORR	6.760	8.616				
	(1.21)	(1.20)				
DEBTCONTR	−1.225	−3.419	−0.334	−2.968	0.691	−0.797
	(0.55)	(1.55)	(0.15)	(1.33)	(0.49)	(0.51)
DEBTEXPL	3.682	1.833	4.018	2.023	3.831	3.311
	(2.49)**	(1.14)	(2.70)***	(1.16)	(3.25)***	(2.42)**
FIX_{t-1}		−2.954		−1.750		−2.518
		(0.92)		(0.59)		(1.12)
INT_{t-1}		−2.815		−2.674		−2.003
		(0.95)		(1.10)		(1.15)
$CAPCON_{t-1}$		0.921		−0.079		0.062
		(1.72)*		(0.23)		(0.25)
$GBAL/GDP_{t-1}$		−0.261		1.278		1.338
		(0.75)		(2.39)**		(3.76)***
TOT_{t-1}		−0.006		−7.785		−6.522
		(0.09)		(1.94)*		(2.05)**
RER_MIS_{t-1}		−8.359		0.011		0.054
		(2.05)**		(0.17)		(1.16)
ECA	−6.763	−11.870				
	(0.77)	(1.10)				
LAC	−14.218	−25.250				
	(1.83)*	(2.41)**				
SAS	9.492	6.063				
	(1.28)	(0.63)				
SSA	−0.461	−4.774				
	(0.06)	(0.44)				
MNA	−2.785	−20.685				
	(0.28)	(1.76)*				
Constant	−58.996	−64.960	10.238	9.354	−5.609	−25.306
	(1.46)	(1.14)	(1.79)*	(0.98)	(0.98)	(1.35)
Observations	399	280	406	280	406	280
N. of countries	95	73	97	73	97	73
Period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust *t*-statistics in parentheses.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

Table 9
Cross country regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	1990–2006		1990–95	1996–01	2002–06	1990–2006		1990–95	1996–01	2002–06
Ln(INF)	−1.968	−7.191	3.672	−4.165	−4.725	−1.367	−5.843	1.498	−3.359	−5.399
	(0.67)	(2.18)**	(0.99)	(1.16)	(1.11)	(0.55)	(2.01)**	(0.48)	(0.95)	(1.35)
CA/GDP	3.504	22.478	139.594	50.531	78.074	21.223	24.647	115.414	63.161	84.738
	(0.10)	(0.46)	(1.72)*	(0.98)	(1.42)	(0.63)	(0.52)	(1.50)	(1.21)	(1.81)*
DEFAULT	1.491	−3.356	7.406	−5.851	−6.779	−3.052	−4.606	1.125	−4.397	−6.333
	(0.30)	(0.63)	(0.83)	(0.95)	(0.86)	(0.67)	(0.92)	(0.15)	(0.67)	(0.81)
$M2/GDP_t$	20.154	15.697	27.098	22.143	2.588	14.934	6.034	39.154	6.658	−2.423
	(2.84)***	(1.94)*	(1.19)	(2.34)**	(0.38)	(2.35)**	(0.82)	(1.81)*	(0.76)	(0.40)
$Ln(GDP)_t$	0.028	0.033	0.070	0.027	0.016	0.034	0.038	0.102	0.040	0.022
	(1.70)*	(1.91)*	(1.28)	(1.27)	(1.26)	(2.14)**	(2.34)**	(1.86)*	(1.99)*	(1.91)*
Ln(GDP_PC)	11.980	16.701	17.460	12.288	14.726	7.334	8.685	10.652	2.620	7.255
	(2.54)**	(2.95)***	(1.78)*	(1.93)*	(2.21)**	(1.73)*	(1.68)*	(1.30)	(0.45)	(1.33)
DEBT/GDP	3.548	−2.919	−16.419	−4.916	6.452	7.215	2.001	−19.658	−4.084	9.312
	(0.28)	(0.21)	(0.95)	(0.25)	(0.28)	(0.60)	(0.15)	(1.24)	(0.20)	(0.40)
$(DEBT/GDP)^2$	−0.888	0.182	2.720	2.025	−2.761	−2.447	−1.730	2.825	1.672	−3.752
	(0.25)	(0.05)	(0.96)	(0.27)	(0.26)	(0.71)	(0.46)	(1.03)	(0.21)	(0.35)
OPEN	−0.120	−0.090	0.093	−0.063	−0.103	−0.075	−0.025	0.096	0.009	−0.053
	(1.67)*	(1.13)	(0.67)	(0.73)	(1.23)	(1.11)	(0.33)	(0.75)	(0.11)	(0.75)
CORR	3.041	−2.747	−8.557	1.234	3.382	3.919	2.179	−7.773	5.975	8.459
	(0.59)	(0.45)	(1.02)	(0.17)	(0.44)	(0.78)	(0.37)	(0.96)	(0.84)	(1.28)
FIX		−17.768	−3.213	−10.906	−11.037		−11.244	1.186	−8.716	−10.62
		(2.16)**	(0.29)	(1.25)	(1.43)		(1.43)	(0.11)	(1.05)	(1.49)
INT		2.998	−14.364	2.519	−5.777		−0.417	−10.712	0.722	−8.060
		(0.24)	(0.99)	(0.22)	(0.59)		(0.03)	(0.74)	(0.06)	(0.88)
CAPCON		0.446	−2.045	0.720	0.116		−0.535	−2.459	−0.244	−0.600
		(0.50)	(1.28)	(0.79)	(0.12)		(0.66)	(1.74)*	(0.29)	(0.71)
GBAL/GDP		−2.739	−2.345	−3.024	−2.454		−2.284	−2.204	−1.944	−2.029
		(2.88)***	(2.03)*	(2.57)**	(2.21)**		(2.44)**	(2.07)**	(1.73)*	(1.88)*
ECA	0.397	−3.177	−32.436	−5.763	−10.922					
	(0.05)	(0.29)	(2.02)*	(0.49)	(0.92)					
LAC	−13.973	−13.179	−32.664	−15.780	−15.202					
	(1.70)*	(1.23)	(2.40)**	(1.39)	(1.27)					
SAS	5.557	−5.814	−10.246	1.860	−5.131					
	(0.47)	(0.42)	(0.60)	(0.10)	(0.32)					
SSA	2.722	11.521	−24.030	9.095	3.079					
	(0.36)	(1.08)	(1.65)	(0.76)	(0.25)					
MNA	−12.599	−19.172	−28.401	−41.357	−22.931					
	(1.22)	(1.62)	(1.86)*	(2.55)**	(1.54)					
CONST	−58.734	−84.046	−104.43	−60.227	−61.453	−25.721	−21.761	−71.003	19.301	−2.105
	(1.41)	(1.74)*	(1.32)	(1.11)	(1.02)	(0.69)	(0.50)	(1.10)	(0.39)	(0.04)
Observations	102	84	48	77	78	102	84	48	77	78
R-squared	0.38	0.50	0.58	0.45	0.46	0.31	0.41	0.47	0.31	0.40

Robust *t*-statistics in parentheses.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

$$DD_{t,i} = \alpha LINF_{t-1,i} + \beta HCC_{t-1,i} + \gamma(LINF_{t-1,i} \times HCC_{t-1,i}) + \lambda X_{t-1,i} + \nu_i + \varepsilon_{t,i}$$

where *DD* is domestic debt share, *LINF* is log inflation, *HCC* is a dummy that takes value one in case of high capital controls, *X* is a matrix of other controls, ν is a set of random or fixed effects, and ε is the error term. Within this setup, β measures the relationship between inflation and domestic debt share in countries that do not have a high level of capital controls, $\beta+\gamma$ measures the relationship between inflation and domestic debt share in countries that have a high level of capital controls, and γ measures the difference between the relationship between inflation and domestic debt share in countries that have a high level of capital controls and the relationship between inflation and domestic debt share in countries that do not have a high level of capital controls. If our hypothesis is correct, we should find that β is negative and statistically significant and γ is positive and, possibly, statistically significant. Indeed, this is what we find in Table 10. The coefficient attached to inflation is always negative and is statistically significant in 5 out of 6 regressions (with a *p*-value of 0.106, the coefficient is close to being statistically significant in the 6th regression). As expected, the coefficients attached to the interaction term are always positive. Moreover, the coefficient is statistically significant in one

Table 10
Interactions between capital controls and inflation.

	Random effects			Fixed effects		
	(1) All developing countries	(2) Middle-income	(3) Low-income	(4) All developing count.	(5) Middle-income	(6) Low-income
$Ln(INF)_{t-1}$	−1.279	−1.117	−5.744	−1.325	−1.227	−3.994
	(2.07)**	(1.65)*	(1.61)	(2.15)**	(1.86)*	(2.26)**
$Ln(INF)_{t-1} \times HCAPCON_{t-1}$	0.994	0.738	5.412	1.005	0.850	4.967
	(1.43)	(0.90)	(1.45)	(1.50)	(1.11)	(2.81)***
CA/GDP_{t-1}	9.863	11.211	79.045	7.197	11.795	15.261
	(0.98)	(0.96)	(3.29)***	(0.68)	(0.96)	(0.52)
$BANKCRIS_{t-1}$	−0.768	−0.130	−4.236	−0.850	−0.077	−2.229
	(0.64)	(0.10)	(0.61)	(0.69)	(0.06)	(0.68)
$DEFAULT_{t-1}$	0.037	−0.384	−0.905	0.092	0.305	−0.196
	(0.03)	(0.26)	(0.25)	(0.07)	(0.23)	(0.06)
$M2/GDP_{t-1}$	8.496	6.966	38.238	6.699	8.239	−23.051
	(1.98)**	(1.52)	(1.71)*	(1.54)	(1.87)*	(1.08)
$Ln(GDP)_{t-1}$	0.044	0.048	−0.161	0.039	0.046	0.949
	(7.24)***	(7.68)***	(0.52)	(4.94)***	(5.35)***	(1.54)
FIX_{t-1}	−0.940	−1.469	2.438	−0.539	−0.340	−3.299
	(0.73)	(0.93)	(0.51)	(0.44)	(0.25)	(1.14)
INT_{t-1}	−1.479	−1.426	−2.484	−1.430	−1.244	−3.041
	(1.66)*	(1.44)	(0.58)	(1.60)	(1.29)	(1.22)
$GBAL/GDP_{t-1}$	−0.267	−0.121	−0.709	−0.234	0.013	−0.813
	(1.57)	(0.64)	(1.31)	(1.33)	(0.07)	(1.97)*
$DEBT/GDP_{t-1}$	12.871	14.395	−48.880	15.867	18.034	35.893
	(4.10)***	(3.53)***	(2.29)**	(5.19)***	(4.54)***	(2.84)***
$(DEBT/GDP)^2_{t-1}$	−2.331	−2.788	18.351	−2.805	−2.967	−9.246
	(3.37)***	(3.24)***	(2.57)**	(3.95)***	(3.79)***	(2.39)**
DRER	−8.305	−8.211	−35.991	−7.046	−7.854	3.514
	(2.00)**	(1.67)*	(2.40)**	(1.63)	(1.57)	(0.47)
$HCAPCON_{t-1}$	−2.717	−3.277	−7.809	−2.754	−3.764	1.535
	(1.33)	(1.36)	(0.93)	(1.36)	(1.54)	(0.51)
RER_MIS_{t-1}	−5.720	−4.048	27.058	−6.506	−4.358	−25.551
	(1.99)**	(1.50)	(1.61)	(2.08)**	(1.48)	(3.06)***
TOT_{t-1}	−0.016	−0.017	0.309	−0.005	−0.002	−0.069
	(0.44)	(0.35)	(2.94)***	(0.14)	(0.04)	(1.41)
$OPEN_{t-1}$	0.029	0.044	−0.196	0.044	0.043	−0.089
	(0.83)	(1.23)	(2.99)***	(1.08)	(0.95)	(1.13)
DEBTCONTR	−1.059	−2.205	14.407	−0.875	−1.804	10.016
	(0.57)	(1.15)	(2.33)**	(0.46)	(0.95)	(1.79)*
DEBTEXPL	5.543	4.190	4.447	5.688	4.283	14.361
	(3.64)***	(2.40)**	(0.49)	(3.66)***	(2.60)***	(3.99)***
Constant	19.112	22.959	26.412	18.203	20.428	7.935
	(2.90)***	(2.80)***	(1.64)	(2.97)***	(2.56)**	(0.66)
Observations	734	582	152	734	582	152
N. of countries	74	52	22	74	52	22
R-squared				0.29	0.30	0.57

Robust *t*-statistics in parentheses.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

regression (column 6) and close to being statistically significant in other three regressions (where the *p*-values of columns 1, 3, and 4 are 0.15, 0.14, and 0.13). The sum of the main and interacted effects ($\beta + \gamma$) ranges between −0.29 and 0.98, but this sum of coefficients in never statistically significant, indicating that there is no significant relationship between inflation and domestic debt share in countries with high capital controls. This evidence is consistent with the idea that our finding of no strong negative correlation between inflation and domestic debt share can be explained with the presence of capital controls and that inflation has a negative impact on the share of domestic debt in countries with low capital controls and no impact in countries with high capital controls.

5. Conclusions

In this paper we use a new dataset on the composition of public debt in developing and emerging market countries to look at the correlation between country characteristics and domestic debt share. We start by showing that there are large regional

differences in the composition of public debt and then we check whether our regressions could help us in understanding the determinants of these differences. Even though we tried to control for a large set of variables, we found that our explanatory variables play almost no role in explaining regional differences. In fact, a simple simulation based on our regressions shows that the "adjusted" regional differences are larger than the raw differences. Another surprising finding is that we do not find a strong correlation between inflationary history and domestic debt share. However, more careful investigation shows that this finding is due to the presence of capital controls. In countries with moderate or no capital controls there is a statistically significant negative correlation between domestic debt share and inflation.

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